REMARKS

Applicants have now had an opportunity to carefully consider the Examiner's comments set forth in the Office Action of November 14, 2005.

Reconsideration is respectfully requested.

The Office Action

Claims 1-2, 4-40 and new claims 41-48 remain in this application. Claims 1-40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Stava (6,291,798) taken with Reynolds et al. (6,177,651).

Applicants have canceled claim 3 from further consideration and have added new claims 41-48.

Claims 1-2 and 4-40 are Distinguished from the Cited Art

In the initial refusal to allow claims 1-40, it is argued in the Office Action that Stava ('798), and in particular Figures 1-6 and 7, substantially discloses an electric arc welding system and method set forth in the claims 1-40. The differences between the claims and Stava ('798) cited in the Office Action were related to particular timing parameters (*e.g.*, a cycle period of 10-20 milliseconds with push or pull times at less than 5.0 milliseconds) and in calling for particular waveforms. However, it was concluded in the Office Action that these differences do not patentably distinguish in view of Reynolds et al. ('651).

Applicants have reviewed the cited Stava ('798) and Reynolds et al. ('651) patents. At the locations cited in the Office Action, Stava describes welding stations 12 operated at either different frequencies or at the same frequency, with an adjusted phase indicated by 360, 362. The welders are noted to include their own controller 100, 100a and 100b to control the frequency of the gate logic signals on lines 170, 172. Phase adjustments are noted to prevent interference between the current driving the electrodes.

Reynolds ('651), recites that one power output may be phase-shifted or staggered with respect to the other power output to help cancel magnetic interaction or to achieve a desired interaction to improve the weld quality. Attention was directed to Figures 2 and 2a to illustrate the use of power sources where phase staggering may be achieved.

However, none of the cited references provide details on how to provide phase shifting between the first and second waveforms in an automated realtime fashion as described in connection with Figure 19 of the present application, in order to achieve push/pull control as shown in Figures 17 and 18.

Independent claim 1 has therefore now been amended to more particularly describe a welding system which includes a detector configured to detect at any time (*e.g.*, in realtime) the polarity of the first waveform of the first AC welding arc and the polarity of the second waveform of the second AC welding arc. Claim 1 also now recites that a comparator is configured to receive the detected polarities of the first waveform and the second waveform, and to determine if the polarities are the same (which identifies a pull state), or if the polarities are opposite (which identifies a push state). Using this information, the apparatus of claim 1 then employs the first timing circuit to determine the push time of a sustained maintenance of the opposite polarity between the waveforms. Thereafter, a waveform adjusting circuit is set to limit the push time to less than about 5.0 milliseconds.

As may be recalled, it was stated in the Office Action, the differences between the claims and the cited art (which call for particular timing parameters) were not sufficient to patentably differentiate over this art. However, it is submitted the art does not teach any manner of detecting the state of polarities such that they may be compared to determine

the actual realtime state being either a push state or a pull state, and thereafter adjusting in an automatic fashion, the operation of the welder to insure that the push state or pull state does not exist for greater than a pre-set time period as now claimed in amended claim 1.

For at least these reasons, it is submitted independent claim 1 is distinguished from the cited art.

An amendment corresponding to that made in claim 1 is also made to independent claim 11. Therefore, for at least this reason, claim 11 is also distinguished.

Applicants have reviewed independent method claims 19 and 29, and have further amended both claims to include steps of detecting, at any time, the polarity of the waveforms, comparing the detected waveform polarities and determining if the polarities are the same or opposite to thereby identify whether a pull state exists or whether a push state exists. Thereafter, the claims determine the push (pull) time of a sustained maintenance and provide an adjustment of the waveforms to limit the push (pull) times to less than about 5.0 ms.

It is submitted for the reasons set forth in connection with the independent claims 1 and 11, the cited references alone or in combination do not teach or fairly disclose the methods set forth in amended independent claims 19 and 29. Particularly, at best, what can be said is that some sort of phase shifting is provided, but how that phase shifting takes place, and the fact that the two waveforms from adjacent arcs are detected and compared to determine the polarities to then allow control of a push or pull time is not taught or fairly suggested. Neither is it shown or fairly suggested that such actions can be accomplished at any time (*e.g.*, in realtime).

As dependent claims 2, 3, 5-10, 12-18, 20-28 and 30-40 are dependent upon the

above-noted independent claims, it is submitted these claims are also distinguished.

New Claims 41-48 are Also Distinguished From the Cited Art

The specification recites that, it is noted that the timer circuit of the present system is not required to be at 5.0 ms. Rather, while 5.0 ms is preferred, this value is not to be considered critical and that the timer may be used to provide times that are less than 5.0 ms. There is no teaching or fair suggestion in any of the cited patents which permits for such an adjustable feature. Thus, new claims 41 and 45 have been drafted to identify that the first timing circuit is adjustable. This, again, is not taught or fairly suggested in the art.

New claims 42 and 46 have been added to emphasize that the first electrode and the second electrode are configured as tandem electrodes, rather than individually provided electrodes. It is submitted the concepts of the push and pull states as defined above which employ tandem electrodes are not taught or fairly suggested.

New claims 43 and 47 emphasize that the phase change between the first waveform of the first electrode and the second waveform of the second electrode is alterable in increments as fine as one degree. Thus, where other systems may have some phase shifting concepts, the present application teaches the additional concept of providing a refined phase altering as refined as one degree.

Lastly, new claims 44 and 48 have been added to clarify that the detector arrangement, comparator arrangement, the first timing circuit and the waveform adjusting circuit are operated or controlled by a controller of the welding system. Thus, the concepts described in the present claims are defined more particularly as being controlled by a controller of the system, which permits for the realtime automatic operation of the welding system and method described in the independent claims.

CONCLUSION

For the reasons detailed above, it is submitted all claims remaining in the application (Claims 1-2, 4-40 and new claims 41-48) are now in condition for allowance. The foregoing comments do not require unnecessary additional search or examination.

In the event the Examiner considers personal contact advantageous to the disposition of this case, he/she is hereby authorized to call Mark S. Svat, at Telephone Number (216) 861-5582.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & McKEE, LLP

2/14/04
Date

Mark S. Svat
Reg. No. 34,261
1100 Superior Avenue, 7th Floor
Cleveland, Ohio 44114-2579
(216) 861-5582

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